UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/801,930	03/16/2004	Severine Catreux	16136US02	4709

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EXAMINER
VLAHOS, SOPHIA

ART UNIT	PAPER NUMBER
2611	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

	Application No.	Applicant(s)
Office Action Summary	10/801,930	CATREUX ET AL.
	Examiner	Art Unit	
	SOPHIA VLAHOS	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on *20 June 2008*.

2a) ☐ This action is **FINAL**.   2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *7-9,11-13,19-21,23-35,37-39,41,42 and 44* is/are pending in the application.

     4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) *7-9, 11-13, 19-21, 23-24, 33-35, 37-39, 41, 42, 44* is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on *20 June 2008* is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.

     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

     a) ☐ All b) ☐ Some * c) ☐ None of:

       1. ☐ Certified copies of the priority documents have been received.

       2. ☐ Certified copies of the priority documents have been received in Application No. _____.

       3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

     * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
     Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
     Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1.   Applicant's arguments with respect to the rejection of claims 10, 22 (now

cancelled) using the reference to da Silveira (U.S. 7,248,656) which does not qualify as

prior art have been considered but are moot in view of the new ground(s) of rejection.

Drawings

2.   The drawings (Fig. 1A, 1B, 2A, 2B) were received on 6/20/08. These drawings

are acceptable.

Claim Rejections - 35 USC § 103

3.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

4.   Claims 7-9, 11, 13, 19-21, 23, 44, 33-35, 41, 37-39 are rejected under 35 U.S.C.

103(a) as being unpatentable over Foschini et. al., (U.S. 6,888,809) in view of Kohno et

al. (U.S. 7,110,468).

        With respect to claims 7-9, 13 Foschini et al., disclose: demultiplexing an input

signal into a first plurality of demultiplexed signals (Fig. 1, see demux 101 outputs,

column 3, lines 35-39); weighting and combining in the baseband domain, said first

plurality of demultiplexed signals prior to said upconverting (Fig. 1, see weights out of

weight supplier 105, supplied to block 103-1, and see adder 111-1 combining said

weighted first plurality of demultiplexed signals, in the baseband domain (since

upconversion takes place in blocks 117-n in a subsequent stage), column 3, lines 54-

59, 66-67, column 4, lines 1-4); upconverting said first plurality of demultiplexed signals

into a first plurality of upconverted signals (Fig. 1, see blocks 117-n that generate a

plurality of upconverted signals from the first plurality of demultiplexed signals, column

4, lines 12-16).

Foschini et al. do not expressly teach: dividing said first plurality of upconverted

signals into a second plurality of divided signals; weighting said second plurality of

divided signals so as to form a second plurality of weighted signals; combining ones of

said second plurality of weighted signals in order to form a third plurality of combined

signals and transmitting said third plurality of combined signals.

In the same field of endeavor (transmission systems using multiple antennas),

Kohno et al. disclose: dividing a plurality of upconverted signals into a plurality of

divided signals (Fig. 4, details of block 130 of Fig. 2, signals S1 and S2 are each (split)

divided into a plurality of n signals, and S1 and S2 correspond to up-converted signals

see column 4, lines 41-43, 47-49 (modulation to carrier frequency of encoded data

streams corresponds to upconverting to carrier frequencies); weighting said plurality of

divided signals so as to form a plurality of weighted signals (Fig. 4, see weighting

performed by weight w1(1)...w1(n) and w2(1)...w2(n) on the plurality of divided signals,

column 5, lines 18-31); combining ones of said plurality of weighted signals in order to

form a plurality of combined signals (Fig. 4, function of adders 133-1…133-n, column 5,
lines 32-45)) and transmitting said plurality of combined signal (Fig. 4, n antennas in
block 140, column 5, lines 47-50).

At the time of the invention it would have been obvious to a person of ordinary
skill in the art to modify the system of Foschini et al. based on the teachings of Kohno et
al. so that error rates of decoded signals are reduced and reliability of the
communications system is improved by maximum likelihood estimation (Kohno et al.,
column 6, lines 41-49).

With respect to claim 11, the system obtained by modifying Foschini et al. based
on the teachings of Kohno et al. includes: wherein said second plurality of divided
signals are RF signals and wherein said weighting and combining are performed within
the RF domain (see the up-converted signals 117-1…117-n of Foschini et al. are split
and weighted and combined as described by Kohno (the beamforming of Fig. 4 is also
performed in the RF signal domain)).

With respect to claim 12, Foschini et al. further teaches: wherein said plurality of
demultiplexed signals are less than said third plurality of antennas (column 1, lines 35-
38, column 3 lines 36-46, less (Y) demultiplexed signals are used compared to N
antennas).

Apparatus claims 19-21, 23-24 are rejected based on a rationale similar to the one used
to reject method claims 7-9, 11-12 above.

With respect to claim 44, the system obtained by modifying Foschini et al. based
on the teachings of Kohno et al. further includes: wherein values of said weighting
elements are selected to maximize an output signal-to-noise ratio of a receiver disposed
to receive said third plurality of combined signals (see Kohno et al. column 6, lines 40-
50, and column 9, lines 56-61, column 10, lines 14-25, where in addition to minimizing
BER, SNR is increased (attempted to be maximized))

With respect to claim 33, Foschini et al. disclose: a demultiplexer disposed to
demutliplex an input signal into a first plurality of demultiplexed signals (Fig. 1, function
of block 101, demux); an arrangement capable of weighting and combining, in the
baseband domain, said first plurality of demultiplexed signals prior to the upconverter
(function of arrangement comprising blocks 103-1 through 103-N, and weight supplier,
see weighting and combining performed by multipliers 113 and adders 111-1 … 111-
N); an upconverter operative to upconvert said first plurality of demultiplexed signals
into a first plurality of RF signals (Fig.1, upconverter comprising up-converters 117-1
through 117-N).

Foschini et al. do not expressly teach: an RF processing network operative to
perform weighting and combining operations in the RF domain upon said first plurality of

RF signals, thereby producing a second plurality of RF signals capable of being transmitted by an antenna structure.

In the same field of endeavor (transmission systems using multiple antennas), Kohno et al. disclose: an RF processing network operative to perform weighting and combining operations in the RF domain upon a first plurality of RF signals (Fig. 4, processing network between S1, S2 and block 140, and signals S1 and S2 correspond to up-converted signals see column 4, lines 41-43, 47-49 (modulation to carrier frequency of encoded data streams corresponds to upconverting to carrier frequencies), column 5, lines 18-50, description of weighting and combining functions) thereby producing a second plurality of RF signals capable of being transmitted by an antenna structure (Fig. 4, outputs of adders correspond to the second plurality of RF signals, that are transmitted by antennas in block 140).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify the system of Foschini et al. based on the teachings of Kohno et al. so that error rates of decoded signals are reduced and reliability of the communications system is improved by maximum likelihood estimation (Kohno et al., column 6, lines 41-49).

With respect to claim 34, the system of Foschini et al. as modified by Kohno et al. further includes: wherein said RF processing network includes an arrangement of dividing elements capable of dividing said first plurality of RF signals into a third plurality of divided RF signals (Fig. 4 of Kohno et al. where RF signals S1, S2 are each divided

by dividing elements (shown as splitting wires) into a third plurality of divided RF

signals)).

With respect to claim 35, the system of Foschini et al. as modified by Kohno et al.

further includes: an arrangement of weighting elements capable of weighting said third

plurality of divided EF signals so as to form a third plurality of weighted RF signals (Fig.

4 multipliers 131-1...131-n, 132-1...132-n and corresponding supplied weights); a

combiner arrangement for combining ones of said third plurality of weighted RF signals

in order to form said second plurality of RF signals (Fig. 4 combiner arrangement

comprises combiners 133-1...133-n, forming the second plurality of RF signals (the

ones capable of being transmitted)).

Claim 41 is rejected based on a rationale similar to the one used to reject claim

44 above.

Claims 37-39, 42 are rejected based on a rationale similar to the one used to

reject claims 33-35, 41 above.

Contact Information

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to SOPHIA VLAHOS whose telephone number is

(571)272-5507. The examiner can normally be reached on MTWRF 8:30-17:00.

     If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammed Ghayour can be reached on 571 272 3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

     Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/SOPHIA VLAHOS/
Examiner, Art Unit 2611
9/15/2008

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